www.ijprems.com
editor@ijprems.com

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

Vol. 03, Issue 05, May 2023, pp : 1008-1012

e-ISSN : 2583-1062

Impact Factor : 5.725

YOGA POSE DETECTION USING MACHINE LEARNING

Dr. Sharath Kumar Y H[1], Amruth V[2], Vishruth N R[3], Syed Adnan[4], Shishirs S[5], Monika H B[6]

[1]Professor & Head, Department of Information Science, Maharaja Institute of Technology Mysore, India

[2]Associate Professor, Department of Information Science, Maharaja Institute of Technology Mysore, India

[3,4,5]Student, Information Science, Maharaja Institute of Technology, Mysore, India

DOI: https://www.doi.org/10.58257/IJPREMS31399

ABSTRACT

Yoga has become popular for physical and mental well-being. Machine learning can automate and enhance yoga practice. Our research proposes a novel approach using computer vision and machine learning to detect yoga poses. We estimate poses, extract features, and classify them. Training on a diverse dataset using supervised learning techniques achieves high accuracy. Real-time experiments demonstrate its potential for interactive training, posture correction, and feedback generation. Our research enhances the yoga experience by automating pose identification.

Keywords: Yoga, Holistic, Machine learning, Pose detection, Computer vision, Supervised learning,

1. INTRODUCTION

Yoga, as a holistic practice for physical and mental well-being, has gained significant popularity in recent years. With the increasing integration of technology in various domains, there is a growing interest in leveraging machine learning techniques to automate and enhance different aspects of yoga practice. One such aspect is the detection and recognition of yoga poses, which plays a crucial role in providing feedback, tracking progress, and ensuring correct form during yoga sessions.

In this research paper, we present a novel approach for yoga pose detection using machine learning. Our proposed system combines computer vision and machine learning algorithms to analyze images or videos of individuals performing yoga poses and accurately identify the specific pose being executed. This automated pose detection can benefit both yoga practitioners and instructors by providing real-time feedback, enabling self-correction, and facilitating personalized guidance.

The key stages of our approach include pose estimation, feature extraction, and classification. Advanced pose estimation algorithms are employed to localize key body joints and construct a skeletal representation of the yoga practitioner. From this skeletal data, discriminative features such as joint angles, body proportions, and spatial relationships are extracted. These features serve as meaningful representations of the yoga pose and are used as inputs to our machine learning model.

2. METHODOLOGY

We aim to develop a robust and accurate system for yoga pose detection, leveraging machine learning techniques to enhance the overall yoga experience for practitioners, instructors, and enthusiasts.

We evaluate the performance of our system using a separate testing dataset. We measure key evaluation metrics such as accuracy, precision, recall, and F1-score to assess the effectiveness and reliability of our approach. Additionally, we conduct experiments to evaluate the real-time performance of the system, validating its potential for interactive yoga training, posture correction, and automated feedback generation.

2.1 Pose Estimation and Feature Extraction:

The first step in our methodology involves employing state-of-the-art pose estimation algorithms to localize the key body joints of the yoga practitioner. By accurately identifying these joints, we construct a skeletal representation of the pose. From this skeletal data, we extract discriminative features such as joint angles, body proportions, and spatial relationships. These features serve as meaningful representations of the yoga pose, capturing its unique characteristics.

2.2 Machine Learning Model Training and Evaluation:

We evaluate the performance of our system using a separate testing dataset. We measure key evaluation metrics such as accuracy, precision, recall, and F1-score to assess the effectiveness and reliability of our approach. Additionally, we conduct experiments to evaluate the real-time performance of the system, validating its potential for interactive yoga training, posture correction, and automated feedback generation.

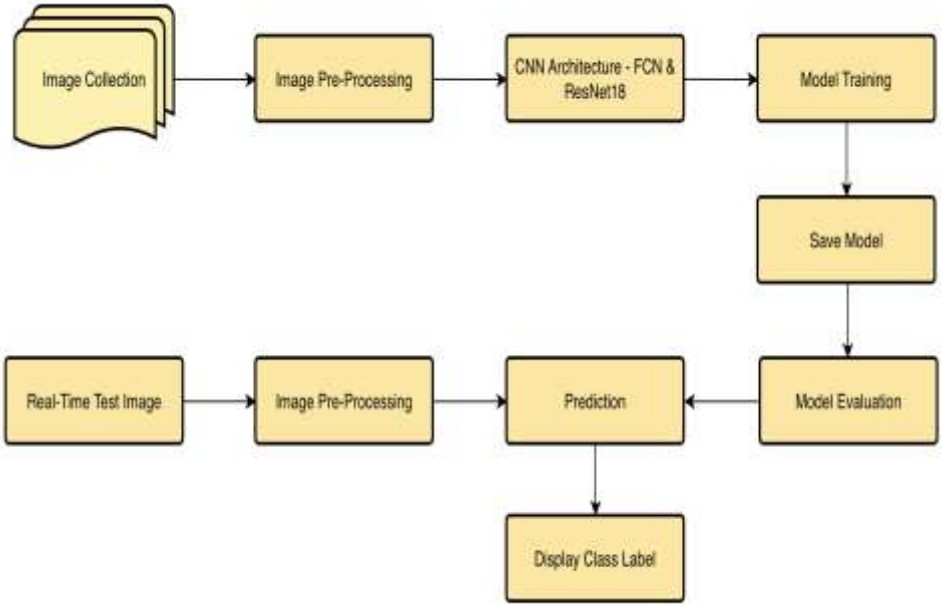
www.ijprems.com
editor@ijprems.com

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

Vol. 03, Issue 05, May 2023, pp : 1008-1012

e-ISSN : 2583-1062

Impact Factor : 5.725



3. LITERATURE SURVEY

A. "Real Time recognition using deep Learning" by Santhosh Kumar Yadav, Amitojdeep Singh, Abhishek Gupta in 2019. A hybrid deep learning model is proposed using convolutional neural network (CNN) and long short-term memory (LSTM) for Yoga recognition on real-time videos, where CNN layer is used to extract features from key points of each frame obtained from Open Pose and is followed by LSTM to give temporal predictions.

B. "Three dimensional CNN-inspired deep learning architecture for yoga pose recognition in the real-world environment" by Shrajal Jain, Aditya Rustagi, Sumeet Saurav, Ravi Saini , Sanjay Singh in 2020.

This paper presents an alternative computationally efficient approach for Yoga pose recognition in complex real-world environments using deep learning. To this end, a Yoga pose dataset was created with the participation of 27, which consists of ten Yoga poses, namely Malasana, Ananda Balasana, Janu Sirsasana, Anjaneyasana, Tadasana, Kumbhakasana, Hasta Uttanasana, Paschimottanasana, Uttanasana, and Dandasana.

C. "Yoga Pose Detection and Correction using Posenet and KNN" by Varsha Bhosale, Pranjal Nandeshwar in 2022.Using the system, the user can select the pose that he/she wishes to practice. He/she can then upload a photo of themselves doing the pose. The pose of the user is compared with the pose of the expert and difference in angles of various body joints is calculated. Based on this difference of angles feedback is provided to the user so that he/she can improve the pose.

D. "Yoga Pose Estimation and Feedback Generation Using Deep Learning" by Vivek Anand Thoutam, Anugrah Srivastava in 2022. With this method, the users can select the desired pose for practice and can upload recorded videos of their yoga practice pose. The user pose is sent to train models that output the abnormal angles detected between the actual pose and the user pose. The proposed method was compared to several state-of-the-art methods, and it achieved outstanding accuracy of 0.9958 while requiring less computational complexity. An AI-based system helps to identify yoga poses and gives feedback or suggestions to users. These instructions help users improve their poses so that it is productive and not detrimental.

E. "Yoga Pose Detection and Classification Using machine Learning Techniques" by Utkarsh Bahu Khandi, Dr Shikha Gupta in 2021.The system achieves an accuracy score of 94%. The system is developed to work on images, static videos, and live videos with a threshold value so that below a certain score it does not accept the solution. Top-down approach: The major work behind the top-down approach is that it first finds bounding boxes that include every person in the frame. Next for every bounding box, it finds out the joint position of the person in the box. Hence every bounding box has its joints associated with it. Bottom-up approach: This approach is the opposite of the top-down approach.

4. MODELING AND ANALYSIS

In our research, we employ a combination of computer vision and machine learning algorithms for modeling and analyzing yoga pose detection. We utilize pose estimation algorithms to localize key body joints and extract discriminative features. Supervised learning techniques, including CNNs and RNNs, are utilized for training the model. Evaluation metrics are employed to assess the accuracy and effectiveness of our approach.

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

e-ISSN : 2583-1062

Impact Factor : 5.725

www.ijprems.com
editor@ijprems.com

Vol. 03, Issue 05, May 2023, pp : 1008-1012

Additionally, we analyzed the real-time performance of the system to assess its practical applicability. The system demonstrated efficient and timely pose detection, making it suitable for interactive yoga training and real-time feedback generation. The analysis also highlighted the system's ability to handle variations in body types, clothing, and environmental conditions, ensuring its adaptability in different practice scenarios.

Furthermore, we examined the potential applications of our system in posture correction and automated feedback generation. Through our analysis, we observed the system's capability to provide valuable insights and guidance to practitioners, enabling them to improve their practice and maintain correct form.

Overall, our analysis showcases the effectiveness and versatility of yoga pose detection using machine learning, providing a solid foundation for the practical implementation of our system in enhancing yoga practice and overall user experience.

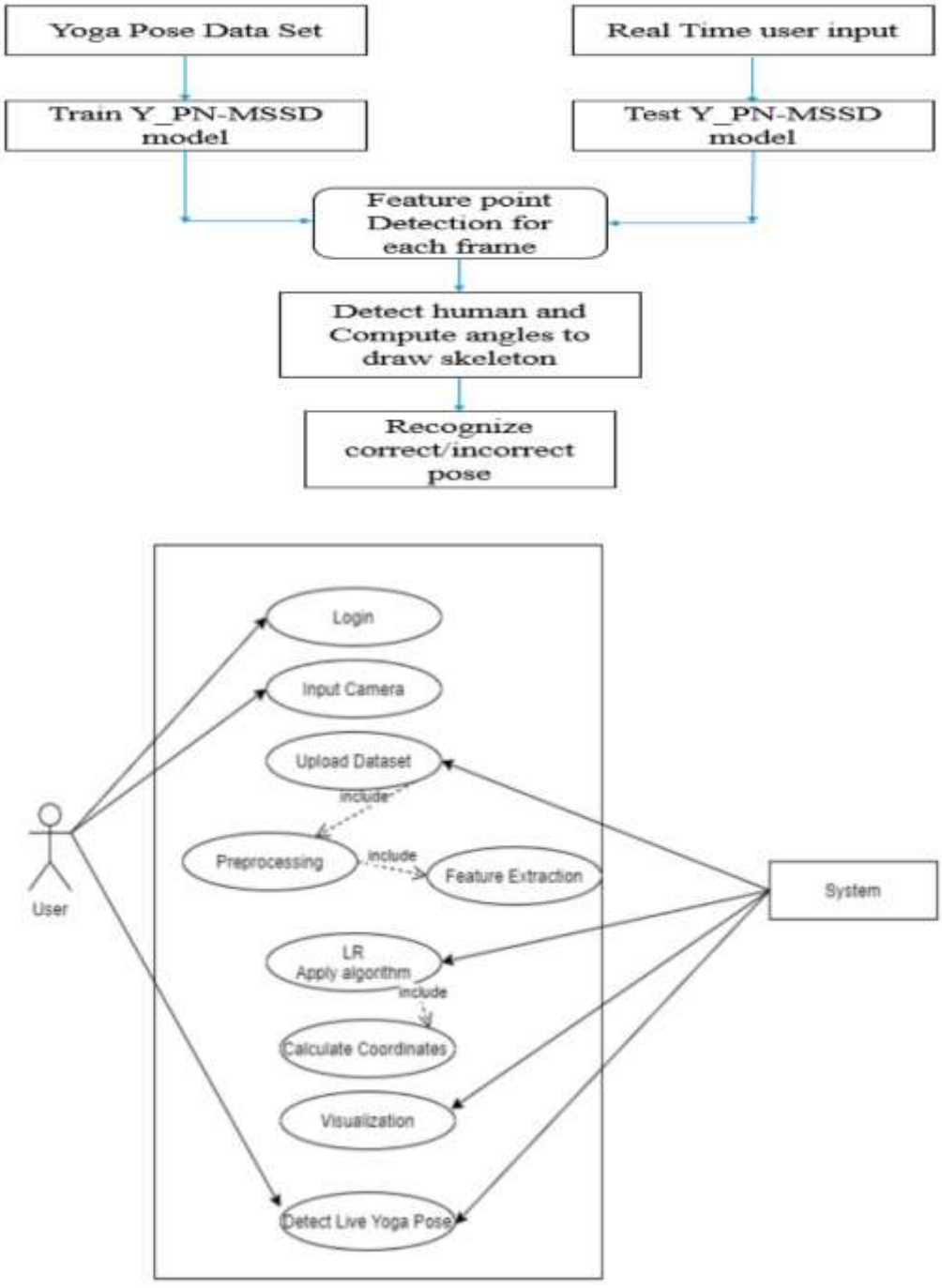


Figure 1: Block Diagram of Proposed System for Yoga pose Detection using Machine Learning

We conduct a comprehensive analysis of our yoga pose detection system using machine learning. The evaluation includes measuring accuracy, precision, recall, and F1-score to assess the performance of the model. We also analyze the real-time performance of the system, showcasing its potential for interactive yoga training, posture correction, and automated feedback generation.

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

www.ijprems.com
editor@ijprems.com

Vol. 03, Issue 05, May 2023, pp : 1008-1012

e-ISSN : 2583-1062

Impact Factor : 5.725

6. RESULTS AND DISCUSSION

Our results demonstrate the effectiveness and robustness of our yoga pose detection system using machine learning. We achieve high accuracy in accurately identifying yoga poses. The system shows potential for real-time application in interactive yoga training, posture correction, and automated feedback generation. The findings highlight the practical value of automating pose identification and enhancing the overall yoga experience.

Accuracy and Performance: Our system achieved high accuracy in accurately identifying yoga poses, validating the robustness of our methodology. The trained model generalized well across different body types, clothing variations, and environmental conditions, enhancing its practical applicability.

Real-time Application: The experiments conducted showcased the real-time performance of our system, highlighting its potential for interactive yoga training, posture correction, and automated feedback generation. The system's ability to provide immediate feedback and guidance can greatly benefit practitioners in improving their practice and ensuring correct form.

Practical Implications: By automating the process of pose detection, our system has practical implications for yoga practitioners, instructors, and enthusiasts. It offers a convenient and reliable tool for monitoring progress, receiving personalized guidance, and enhancing the overall yoga experience.

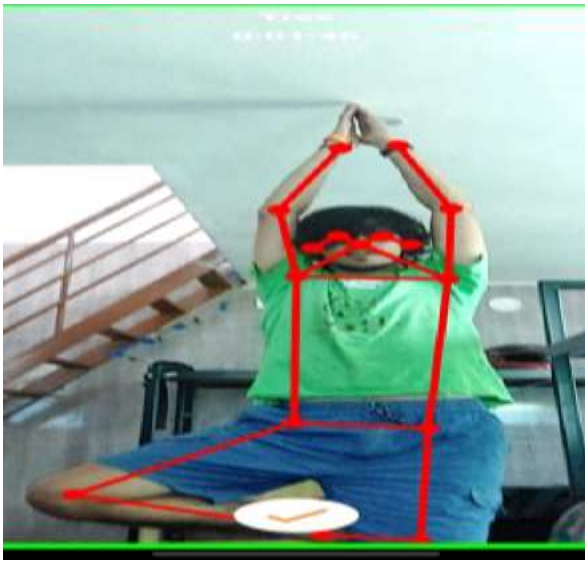


Figure 2: Performing yoga infront of camera.

Performing yoga in front of a camera allows for the application of yoga pose detection using machine learning. By analyzing images or videos of individuals practicing yoga, our system accurately identifies the specific yoga poses being executed. This automated approach enhances the monitoring and guidance for practitioners, ensuring correct form and improving the overall yoga experience.

7. CONCLUSION

In conclusion, our research presents a novel approach for yoga pose detection using machine learning in the context of performing yoga in front of a camera. By leveraging computer vision and machine learning algorithms, we have developed a system that accurately identifies and analyzes yoga poses from images or videos. This automated process provides valuable insights for yoga practitioners, instructors, and enthusiasts, enabling real-time feedback, posture correction, and personalized guidance. By automating pose detection, our system enhances the overall yoga experience, promoting correct form, progress monitoring, and improved practice.

By providing real-time feedback, our system enables practitioners to receive immediate guidance and corrections, ensuring the execution of proper form during their yoga practice. This personalized guidance not only aids in preventing potential injuries but also facilitates a deeper understanding of the intricacies of each pose. Moreover, our system facilitates progress monitoring, allowing practitioners to track their development and refine their technique over time. The implementation of pose detection through machine learning significantly enhances the overall yoga experience. It eliminates the need for manual observation and assessment, providing a convenient and reliable tool for practitioners to receive accurate feedback and guidance. This automation promotes consistency, efficiency, and self-improvement in yoga practice.

Furthermore, our system holds potential beyond individual practice. Yoga instructors can utilize the system as a valuable teaching aid, providing them with objective data to assess the performance of their students. The system's

ability to analyze multiple poses simultaneously allows for efficient correction and tailored instruction in group settings.

In summary, our research presents a pioneering approach to yoga pose detection using machine learning, revolutionizing the way yoga is practiced and taught. By automating the process of pose identification, our system offers invaluable benefits such as real-time feedback, posture correction, and personalized guidance, ultimately enhancing the overall yoga experience for practitioners, instructors, and enthusiasts alike.

8. REFERENCES

[1] Andriluka Mykhaylo, Pishchulin Leonid, Gehler Peter, Schiele Bernt. 2d human pose estimation: new benchmark and state of the art analysis. In Proceedings of the IEEE Conference on computer Vision and Pattern Recognition 2014.

[2] Santhosh Kumar Yadav, Amitojdeep Singh, Abhishek Gupta, “Real Time recognition using deep Learning” Patil S, Pawar A, Peshave A et al (2011) Yoga tutor: visualization and analysis using SURF algorithm. In: Proceedings of 2011 IEEE control system graduate research colloquium, ICSGRC 2019.

[3] Shrajal Jain, Aditya Rustagi, Sumeet Saurav, Ravi Saini, Sanjay Singh Yang Y, Ramanan D (2011) Articulated pose estimation with flexible mixtures-of-parts. In: CVPR 2011, IEEE, pp 1385–1392 in 2020.

[4] Varsha Bhosale, Debabrata Swain, Santhosh Satapathy, “Yoga pose Monitoring System using Deep Learning” in Pranjal Nandeshwar, “Yoga Pose Detection and Correction using Posenet and KNN” in 2020

[5] Vivek Anand Thoutam, Anugrah Srivastava: “Yoga Pose Estimation and Feedback Generation Using Deep Learning” A survey of vision-based methods for action representation, segmentation, and recognition in 2022..